UNIVERSITY OF CALIFORNIA
COLLEGE OF AGRICULTURE
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MANAGEMENT PRACTICES WITH LARGE LIMA BEANS IN SOUTHERN CALIFORNIA

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MANAGEMENT PRACTICES WITH LARGE LIMA BEANS IN SOUTHERN CALIFORNIA[1]

WALLACE SULLIVAN,[2] WILLIAM M. CORY,[3] AND MILTON D. MILLER[4]

INTRODUCTION

THIS BULLETIN has been prepared for the purpose of presenting to growers of large lima beans and others interested, a summary and an analysis of the large-lima-bean enterprise-efficiency study conducted by the Agricultural Extension Service of the University of California in coöperation with growers in Ventura and Orange counties. Other factors closely related to management practices are included in order to complete the picture of all the problems having a bearing on the economic success of such an enterprise.

ENTERPRISE-EFFICIENCY STUDIES

In order to assist growers of large lima beans, the Agricultural Extension Service of the University of California since 1928 has conducted, in coöperation with interested growers in Ventura and Orange counties, studies of the costs of producing large lima beans, inputs of labor and field power, quantities of material used, kinds, number, and time of operations, and the relation of these management practices to yield, income, and net profit. These studies are called enterprise-efficiency studies, and as the name implies, their fundamental purpose is to study the efficiency of large-lima-bean production on individual farms with a view to improving it. To accomplish this purpose, accurate information has been obtained from a large number of growers on yield, cost, income, and management practices, and the tables herewith presented are taken from records reported by growers.

METHOD OF CONDUCTING ENTERPRISE-EFFICIENCY STUDIES

An enterprise-efficiency study is conducted by the local farm advisor in coöperation with local growers who provide accurate and detailed records on a particular field or block. Such an individual record may comprise the operator's entire farming operations or be only a part of them. Some coöperators may provide more than one record, the fields being on different soil types or in different locations. Since participation

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is voluntary, the records obtained are not necessarily a true cross section of the large-lima-bean industry. Records in the study probably represent the better-than-average producer. As each year of an enterprise-efficiency study is completed, the coöperating grower is given a detailed record and analysis of his operations, and a mimeographed summary of all records in the study is issued for limited public distribution.

GENERAL CHARACTERISTICS OF THE LARGE-LIMA-BEAN STUDY

The records presented in this analysis cover an eight-year period, 1932–1939. They were secured from growers in Ventura and Orange counties, the two leading counties in production. About 20 records annually have been made on the average in the two counties combined; for the eight-year period a total of 161 records covering 17,875 acres has been completed. Land operated by tenants was covered by 86 records, and land operated by owners, by 75 records. Irrigation costs were reported by 113 records, and 48 reported no irrigation. Prices of large limas received by growers during the period varied from $3.82 to $6.30 per hundredweight.

EXPLANATION OF TERMS

Total Income.—Total income is the result of yield times price of the product. Warehousing, cleaning, and selling are considered as part of the marketing process and their costs are deducted from income. Hence, income and prices are computed upon delivery of the beans to the warehouse. Income from bean straw is computed from price received at the farm or estimated market value.

Total Costs.—These include all man labor (both hired and operator's), all field power (both hired and owned by the operator), all material and cash costs, depreciation charges on improvements and equipment, interest on investment calculated at 5 per cent (excepting field power), and rent on land.

Management Income.—Management income is total income less total cost.

Capital and Management Income.—Management income plus the charges made for interest on capital investment or rent paid for the use of the land is called "capital and management income."

PRODUCTION OF LARGE LIMA BEANS

The production of lima beans is well adapted to large-scale farming and the efficient utilization of power machinery. During the past sixty years, growers have, by experimentation and observation, adjusted their management practices to a very high degree of efficiency.

The large lima bean was first grown commercially in the Carpinteria Valley, Santa Barbara County, in the early 1870's. The climate and soil proved to be ideal for its growth. This caused its trial in other parts of the state, but the area of successful production appeared to be limited to certain sections near the place of original introduction. Its production spread to Ventura, Los Angeles, Orange, and San Diego counties.

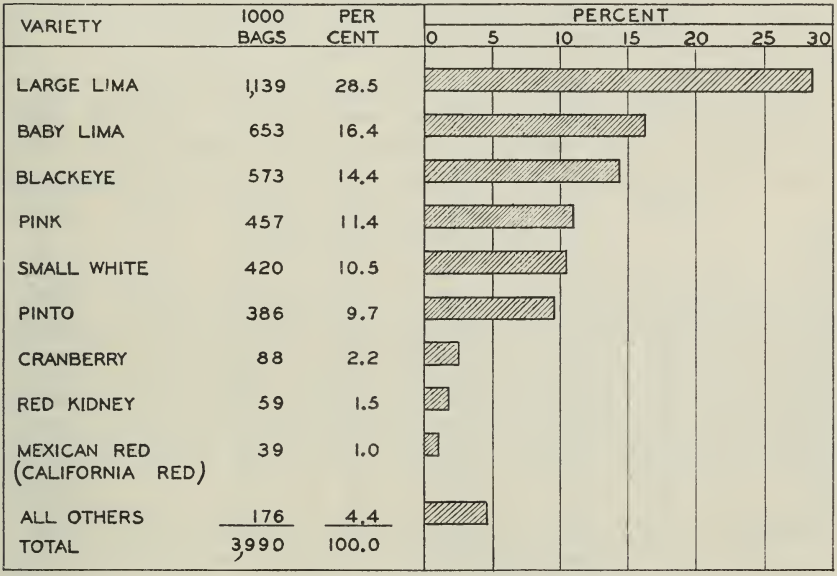

Fig. 1.—Relative importance of the principal varieties of California beans in 1939. Data from: California Coöperative Crop Reporting Service. Dry edible bean production by varieties for California and for other leading states. 2 p. December 27, 1940. (Mimeo.)

LARGE LIMAS VS. BABY LIMAS

For many years the large-seeded variety was the only kind of lima bean grown commercially in the United States. During this period the name "lima bean" was sufficient to identify this particular bean in the mind of the public.

By 1917 small-seeded varieties of lima beans came into extensive commercial production. Since these are well adapted to other bean-growing areas of the state, production expanded rapidly. In 1939, 16.4 per cent of all beans produced in California were of this type (fig. 1). During this period the small-seeded lima has been put on the market under the names of "bush lima," "baby lima," "Hopi lima," and "small lima." In 1923, growers of the small-seeded types asked the California Lima Bean Growers' Association to market their product. Their request was granted, and to facilitate marketing as well as to differentiate between

this type and the large-seeded type, they were called "baby lima." The name now generally used for this whole group is baby lima and is used as such in this bulletin.

Because of the increase in volume of the small-seeded type, the term "lima" was no longer sufficiently distinctive to denote the large-seeded

TABLE 1

CALIFORNIA ACREAGE, AVERAGE YIELD, PRODUCTION, CARRYOVER, AND F. O. B. PRICE PER HUNDREDWEIGHT FOR LARGE LIMA BEANS, 1926–1939

Year	Acreage harvested	Average yield per acre, recleaned	Total production	Carry-over*	Production plus carryover	F.o.b. price† per cwt.	Total value
	1	*2*	*3*	*4*	*5*	*6*	*7*
	thousand acres	*100-pound bags*	*thousand bags*	*thousand bags*	*thousand bags*	*dollars*	*thousand dollars*
1926	98	12.8	1,250	45	1,295	6.10	7,625
1927	98	10.3	1,010	167	1,177	7.50	7,575
1928	79	11.3	890	15	905	12.25	10,902
1929	95	10.4	987	3	990	11.70	11,548
1930	95	11.6	1,102	16	1,118	6.85	7,549
1931	95	11.2	1,064	75	1,139	4.25	4,522
1932	68	12.8	872	93	965	4.77	4,159
1933	67	14.1	943	47	990	5.52	5,205
1934	79	13.6	1,072	65	1,137	5.57	5,971
1935	90	11.0	989	87	1,076	6.62	6,547
1936	97	11.5	1,119	26	1,145	7.23	8,090
1937	103	13.8	1,419	60	1,479	4.87	6,911
1938	95	14.7	1,395	147	1,542	4.55	6,347
1939	94	12.1	1,139	317	1,456	4.87	5,547
Average	89.5	12.2	1,089	83	1,172	6.46	7,036

* Carryover at beginning of season, September 1.
† Simple average of weekly quotations, year September 1 to August 31.

Sources of data:
Cols. 1–3: 1926–1937: United States Bureau of Agricultural Economics. Dry beans. Production by commercial classes. January 24, 1938. (Mimeo.)
1938–1939: California Coöperative Crop Reporting Service. California field crop reports, monthly and annual. (Mimeo.)
Cols. 4 and 6: *California Fruit News*, weekly issues.
Col. 5: Col. 3 plus col. 4.
Col. 7: Col. 3 times col. 6.

type. Many handlers and consumers erroneously came to regard the small-seeded baby limas merely as a small-sized grade of the large-seeded type. Consequently, to differentiate between the two distinct types, the producers of large lima beans came to use such names as "common lima," "large lima," "standard lima," "regular lima," "original lima," and "California lima." The name "large lima" will be used in this bulletin.

IMPORTANCE IN CALIFORNIA

On the basis of total amount produced and gross returns, the large lima is the most important type of bean grown in California. Its production in 1939 was almost twice that of baby limas, the second most important variety, and about twice that of Blackeye beans (fig. 1).

Six varieties—large lima, baby lima, Blackeye, Pink, Small White, and Pinto—comprise nearly 90 per cent (fig. 1) of the bean production in the state. The first two combined make up nearly 45 per cent.

During the period 1926–1939 the harvested acreage of large limas has varied from 67,000 in 1933 to 103,000 in 1937, with an average of about 89,500 for the fourteen-year period (table 1). The average yield per acre has varied from 10.3 100-pound bags of recleaned beans in 1927 to 14.7 in 1938, with an average of 12.2. The total yield varied from 872,000 bags in 1932 to 1,419,000 in 1937, with an average for the fourteen-year period of 1,089,000 bags. The annual average f.o.b. price per hundredweight as reported by the *California Fruit News,* varied from $4.25 in 1931 to a high of $12.25 in 1928. The total annual value has ranged from $4,159,000 to $11,548,000, with an average of $7,036,000.

PRODUCTION BY COUNTIES

Table 2 presents the acreage of large lima beans in California by counties for the years 1937, 1938, and 1939, as reported by the California Lima Bean Growers' Association. During the period, Ventura County led the state in acreage, with an average of 42.5 per cent of the total. Orange County was second with an average of 29.5 per cent, followed by San Diego County with 11.8, Los Angeles with 9.1, and Santa Barbara with 7.0.

The acreage of irrigated beans averaged 57.6 per cent of the total for the three-year period, and dry-farmed, 42.4 per cent.

LIMITING FACTORS IN PRODUCTION

Climate.—Climate more than any other factor limits the production of large limas. Large-lima-bean production is confined to a narrow strip of land 8 to 10 miles wide extending south from Point Conception to the Mexican border through Santa Barbara, Ventura, Los Angeles, Orange, and San Diego counties.

The climate in this area is characterized by heavy summer fog and cooling ocean breezes. The large lima plant does best in moderate summer weather. If the temperature is too high or the relative humidity too low, yields will be markedly reduced as a result of a consequent blossom and young-fruit drop. It is said that limas will "make a crop out of fog." Dense fogs are most frequent along this area in the five months from June to October, the growing season of the large lima.

The principal benefit of the fog is in lessening transpiration losses and in tempering the atmosphere. Another factor of importance in moderating the climate is the prevailing cool sea breezes.

TABLE 2

LARGE LIMA BEAN ACREAGE BY COUNTIES, 1937–1939

County	1937 Acreage				1938 Acreage				1939 Acreage			
	Irrigated	Dry-farmed	Total	Percentage of total state acreage	Irrigated	Dry-farmed	Total	Percentage of total state acreage	Irrigated	Dry-farmed	Total	Percentage of total state acreage
	acres	*acres*	*acres*	*per cent*	*acres*	*acres*	*acres*	*per cent*	*acres*	*acres*	*acres*	*per cent*
Ventura	29,234	14,952	44,186	42.9	28,262	13,611	41,873	43.9	27,803	10,568	38,371	40.8
Orange	27,485	5,161	32,646	31.7	22,256	4,476	26,732	28.1	24,773	2,310	27,083	28.8
Los Angeles	1,750	8,000	9,750	9.4	1,300	7,500	8,800	9.2	1,000	7,250	8,250	8.8
San Diego	800	8,440	9,240	9.0	2,250	9,075	11,325	11.9	950	12,767	13,717	14.6
Santa Barbara	100	7,170	7,270	7.0	200	6,340	6,540	6.9	160	6,375	6,535	7.0
State total	59,369	43,723	103,092	100.0	54,268	41,002	95,270	100.0	54,686	39,270	93,956	100.0

Source of data:
California Lima Bean Growers' Association, annual reports.

Lack of summer rains in this area permits the production of the crop without poling. Lima-bean pods are extremely susceptible to mold damage, especially during humid, warm summer rains. The absence of summer rains, and hence, the elimination of mold damage, makes possible a material saving in costs of production over regions where it is necessary to pole the vines to prevent excessive pod-mold damage.

These natural factors have, in the past, confined the commercial production of large limas (dry beans) to this restricted area.

Soils.—The production of large limas within this area is limited to some extent also by the quality of soil. Large lima beans will give the most satisfactory yields when grown upon uniform soils of the loam or clay loam textures, drained to a depth of 6 feet or more, and neutral or slightly alkaline in reaction. While they may be grown on other soil textures, difficulty is experienced in securing a sufficiently fine tilth on heavy soil or in maintaining an adequate moisture supply throughout the growing season on sandy soil. In general, the main physical and chemical properties would be the same as those recognized as the best truck-crop soils.

Large limas have been grown continuously in some fields for a period of over forty years without rotation with other crops on Yolo and Chino clay loam soils. Although this practice cannot be regarded as one to be commended for crops in general, on the better soil types there has been no apparent decrease in yields due to depletion of essential plant nutrients. As a result of continuous cropping, however, there has been an increase in diseases and insects, characteristic of this plant, which has caused a heavier seeding rate than was formerly practiced.

Lands over which flood waters have deposited sand strata of varying thicknesses or where sand strata have been overlaid or underlaid with silt, have been reclaimed by plowing from depths of from 3 to 6 feet, the depth depending on location of the subsoil strata. This practice has resulted in increased productiveness of the land, except in those instances where alkali salts had been leached to lower levels and were returned to the surface by deep plowing. An approximate schedule of costs is :

Depth of plowing, in feet	Cost per acre, in dollars
2	10
3	15
4	25
5	35
6	45

In addition, it will cost approximately $10.00 per acre to level the land after such deep plowing.

Competing Crops.—Economic consideration has been the dominant factor in determining the acreage planted. Other crops that offer promise of greater profits per acre will naturally tend to replace beans. That the large lima bean has been able to hold its place in competition for the most profitable use of land is indicated in table 1. During the period 1926–1939 the acreage and production remained fairly constant. Other annual crops compete with limas for land use. When the price of limas is low and costs are high in comparison to other crops, the total acreage is reduced and other crops occupy the land. In the past, citrus fruits and walnuts have competed most successfully for land devoted to limas.

Intercrop.—Large limas can be successfully grown between the tree rows of young citrus or walnuts without apparent injury to either crop. In this way limas have borne a large share of the cost of bringing many orchards into full-bearing. Of course, as the orchards come into maturity, the land is eliminated from future bean production. The effect of this may be reflected in a reduction of the total bean production in the future.

YIELD, PRICE, AND COSTS

The ultimate aim of each grower is to obtain the highest possible returns on his investment. Since yield per acre definitely limits total income, it is to the advantage of the grower to obtain good yields over a period of years. Another important factor in determining income is price. Better crops bring better prices, and the grower producing fewer cull beans will obtain a higher average price per pound. The third main factor influencing income is the cost per acre. For example, with similar yields per acre and similar prices, one grower may show a fair return on his investment and another a loss because of higher costs, which might indicate inefficient management.

Table 3 presents a general summary of yield, income, and costs for the eight-year period, 1932–1939, compiled from enterprise-efficiency-study records in Ventura and Orange counties. The yield and income are separated into recleaned beans, cull beans, and bean straw. Costs are grouped into major items of cultural and harvest labor and field power, materials used, cash overhead, depreciation, and interest on investment or rent. These major items are discussed in more detail in subsequent tables.

Yield per Acre.—The average yield per acre for the annual summaries (table 3) varies as follows: recleaned beans, from 986 pounds to 2,347, with an average of 1,345 pounds; cull beans, from 76 pounds to 122, with an average of 87 pounds; bean straw, from 0.78 ton to 1.04, with an average of 0.83 ton. The average annual yield per acre for all large lima beans in the state, as reported by the California Coöperative

TABLE 3

General Summary of Large-Lima-Bean Enterprise-Efficiency-Study Records, Ventura and Orange Counties, 1932–1939

	1932	1933	1934	1935	1936	1937	1938	1939	8-year average
Number of records	2	11	24	20	14	21	35	34	161*
Total acres	112	635	4,908	2,079	1,602	2,771	3,027	2,741	17,875*
Average number acres per record	56	58	204	104	114	132	86	81	111
Average yield per acre:									
Beans, recleaned, pounds	2,347	1,261	1,182	986	1,138	1,574	1,586	1,508	1,345
Culls, recleaned, pounds	111	117	76	96	122	77	83	87	87
Straw, tons	1.04	0.82	0.79	0.91	0.78	0.80	0.87	0.87	0 83
Income and costs in dollars per hundredweight (except income for straw)									
Average price recleaned	3.82	4.82	4.94	5.72	6.30	4.22	4.07	4.10	4.64
Average price cull beans	0.44	0.41	0.41	0.40	0.40	0.41	0.40	0.40	0.40
Average price straw, per ton	5.00	3.70	5.39	4.00	6.00†	6.05†	3.18	3.15	4.55
Cash and depreciation costs	2.22	3.26	2.83	2.58	3.17	2.66	2.33	2.33	2.63
Interest or rent	1.67	2.41	1.99	2.19	2.23	1.62	1.60	1.60	1.82
Total costs	3.89	5.67	4.82	4.77	5.40	4.28	3.93	3.93	4.45
Total income, all sources‡	4.06	5.10	5.33	6.13	6.75	4.55	4.27	4.30	4.95
Management income	0.17	−0.57	0.51	1.36	1.35	0.27	0.34	0.37	0.50
Capital and management income	1.84	1.84	2.50	3.55	3.58	1.89	1.93	1.97	2.33
Income and costs in dollars per acre									
Income:									
Grade 1 beans	89.67	60.83	58.39	56.38	71.72	66.44	64.56	61.81	62.45
Cull beans	0.49	0.48	0.31	0.38	0.49	0.31	0.33	0.35	0.35
Straw	5.22	3.03	4.28	3.64	4.66	4.87	2.76	2.73	3.80
Total income all sources	95.38	64.34	62.98	60.40	76.87	71.62	67.65	64.89	66.60
Costs:									
Cultural labor and field power	18.46	10.64	9.22	10.87	12.34	14.09	12.12	12.60	11.56
Harvest labor and field power	9.29	9.18	8.47	5.21	6.09	7.88	7.28	6.87	7.38
Materials (water, seed, etc.)	5.94	8.21	6.84	5.75	12.98	11.27	8.73	8.89	8.63
Cash overhead (taxes, etc.)	14.48	9.26	6.61	2.39	3.59	7.17	7.48	5.53	6.06
Total cash costs	48.17	37.29	31.14	24.22	35.00	40.41	35.61	33.89	33.63
Depreciation	3.93	3.84	2.32	1.17	1.07	1.43	1.39	1.29	1.68
Total cash and depreciation	52.10	41.13	33.46	25.39	36.07	41.84	37.00	35.18	35.31
Interest on investment or rent	39.18	30.47	23.47	21.58	25.45	25.52	25.25	24.04	24.48
Total all costs	91.28	71.60	56.93	46.97	61.52	67.36	62.25	59.22	59.79
Management income	4.10	−7.26	6.05	13.43	15.35	4.26	5.40	5.67	6.81
Capital and management income	43.28	23.21	29.52	35.01	40.80	29.78	30.65	29.71	31.29

* Eight-year total, not eight-year average.
† Includes some baled.
‡ Income from straw and dockage converted to equivalent per hundredweight of recleaned beans in calculating total income.

Crop Reporting Service (table 1) for the period 1926–1939, varied from 10.3 to 14.7 100-pound bags. The average yields for the records in the study are slightly higher than the state average.

Income and Costs.—The average price received (net f.o.b. warehouse) for recleaned beans varied from $3.82 to $6.30, with an average of $4.64 per hundredweight, cull beans averaged $0.40 per hundredweight, and straw $4.55 per ton. Total income from all sources for each 100 pounds of recleaned beans averaged $4.95.

Total costs per hundredweight varied from $3.89 to $5.40, with an average of $4.45. Management income per hundredweight varied from –$0.57 to $1.36, with an average of $0.50. Cash and depreciation costs, that is, all costs except the 5 per cent interest on capital investment or rent on land, ranged from $2.22 to $3.26, with an average of $2.63 per hundredweight. Certain costs are relatively fixed regardless of yield; hence, costs per hundredweight are usually lower when yields are higher than average.

Total all costs per acre varied from $46.97 to $91.28, with an average of all enterprise-efficiency records of $59.79. This wide variation is accounted for mainly in the differences in yield and interest on investment or rental costs. Total cash and depreciation costs per acre, that is, without including capital and land charges, ranged from $25.39 to $52.10, with an average of $35.31.

Income from recleaned beans per acre varied from $56.38 to $89.67 with an average of $62.45. Cull beans averaged $0.35, and bean straw, $3.80. Management income per acre varied from –$7.26 to $15.35, with an average of $6.81. Capital and management income per acre, that is, income above cash and depreciation costs, ranged from $23.21 to $43.28, with an average of $31.29.

The costs and income for major items are divided on a percentage basis as follows:

	Per cent of total
Costs:	
All cultural labor and field power	19.4
All harvest labor and field power	12.3
Total labor and field power	31.7
Interest on investment and rent (combined)	40.9
All materials used	14.5
Cash overhead	10.1
Depreciation on improvements and equipment	2.8
Total	100.0
Income:	
Recleaned beans	93.8
Culls and straw	6.2
Total	100.0

Cultural labor and field power include all costs of man labor, tractor, horse, truck, and automobile used in the production of beans up to the time of harvest. All harvest labor and field power include the same items from the beginning of the harvesting operations until the beans are delivered to the warehouse. The relative importance of the major cost items is indicated in the above table and is useful in budgeting expenses for the year's operations. Rent on land or interest on capital invested in land is the largest single item. This is of particular significance to the tenant farmer who pays approximately 40 per cent of all costs to the landowner. To the owner-operator free from debt this represents income as well as a cost. Labor and field power represent approximately one third of all costs and is the group of costs in which the skill and judgment of the management is most effective in the reduction of costs.

DETAILED ANALYSIS OF COSTS

Costs are shown in detail in tables 4 to 9 in such a way as to be useful to the individual grower in checking and comparing his own costs. When the cost of an operation or of materials used is considerably above that of the average of a large number of records, a definite cost handicap is present. Such a high cost may be due to extravagance or unnecessary inputs of tillage operations, quantities of materials used, or it may be due to the paying of higher prices than necessary for labor and materials, or the inefficient use of field power and equipment. Each unit of input of labor or materials should be tested by the question: Will it pay? Will yields be increased enough to more than cover the cost of another cultivation, another irrigation, or more and better seed? In some cases profits may be increased by increasing the number of cultivations, or irrigations, or the amount of fertilizer used. The goal of a good manager should be to determine at what point returns will not exceed the cost of an additional unit of inputs.

Enterprise-efficiency studies are standardized and set up on a uniform basis so that they may be used as a measure of efficiency.

LABOR AND FIELD-POWER COSTS

The cost of labor and field power for all records in this study averaged $18.94 per acre (table 4), which is 31.7 per cent of all costs. These costs are divided into three major groups: land preparation for seeding, planting and crop cultivation, and harvesting. These groups of costs perhaps offer the largest opportunity for the exercise of the skill and judgment of the management in reducing costs.

Land Preparation.—The preparation of land for seeding is considered particularly significant by growers in the production of large

lima beans. The seed is likely to mold, rot, or make a slow start in germination and early growth if the land is not in good tilth, with adequate moisture and ideal temperature. The lack of ideal seedbed preparation results in a poor stand, additional costs of replanting, and a lower yield. The ideal seedbed is one with a fine, dry mulch from 2 to 3 inches deep, underlain with a firm, moist soil ranging in temperature from 65°

TABLE 4

AVERAGE COSTS* PER ACRE OF MAN LABOR AND FIELD POWER,† 1932–1939

Operations	1932	1933	1934	1935	1936	1937	1938	1939	8-year average
	dollars	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*
Land preparation:									
Plowing	—‡	2.82	1.15	2.15	2 27	2.59	2.70	2.71	2.27
Subsoiling	4.14	—	1.48	1.21	4.44	1.35	1.81	1.85	1.64
Chiseling	2.65	0.96	1.50	0.96	0.78	2.19	2.23	1.27	1.51
All other	9.95	5.86	1.64	4.33	3.57	4.12	3.97	3.96	3.44
Average total costs*	13.87	7.12	3.60	7.90	6.74	7.49	7.62	7.98	6.42
Planting and cultivating:									
Planting	0.84	0.60	0.63	0.72	0.67	0.86	0.63	0.63	0.68
Cultivating	1.97	1.38	0.87	0.78	1.47	1.29	1.26	1.10	1.26
Hoeing	0.73	0.72	0.53	0.81	1.21	1.95	1.41	1.49	1.04
Irrigating	1.01	1.57	2.05	1.79	3.12	1.81	1.15	1.40	1.71
Average total costs*	4.59	3.52	5.62	2.97	5.60	6.60	4.50	4.62	5.14
Harvesting:									
Cutting	0.60	0.61	0.62	0.65	0.69	0.72	0.70	0.62	0.65
Windrowing and piling	0.85	1.56	2.02	0.82	1.00	1.10	0.96	1.25	1.23
Threshing	7.42	4.73	4.33	3.44	4.37	5.48	5.10	4.48	4.60
Hauling	0.42	0.48	0.41	0.30	0.31	0.61	0.56	0.50	0.46
Average total costs*	9.29	9.18	8.47	5.21	6.09	7.88	7.28	6.87	7.38
Average total costs,* all operations	27.75	19.82	17.69	16.08	18.43	21.97	19.40	19.47	18.94

* The cost per acre for each operation shown is the average cost for the acres on which the operation was performed; hence, the average total cost per acre, which is the average for all acres reporting, is not necessarily the sum of the individual items.

† Field power is charged at an hourly rate to cover interest and depreciation as well as operating cost; contract work is charged at the rate paid for such work.

‡Dashes indicate data not available.

to 70° F. Much labor and field power, particularly on the heavier soils, are expended in obtaining this objective.

The average cost of all records for seedbed preparation was $6.42 per acre. This represents an approximate input of 4 hours of man labor and field power per acre. The actual tillage operations performed by the operators varied widely according to the type of soil, rainfall, and changing seasons. The average annual costs varied from $3.60 to $13.87.

A fairly deep stirring of the soil is a tillage operation common to all records. This is accomplished by plowing or subsoiling. Crop residue from a preceding crop is usually disked into the soil early in the fall.

The land is then dry-plowed or subsoiled. Plowing is usually performed with a three- or four-bottom 14-inch moldboard plow drawn by a 30- or 45-horsepower tractor. This will plow about 1 acre per hour. The average cost of this operation for all records was $2.27 per acre. If subsoiling is performed, it usually is to a depth of 16 to 30 inches. The average cost of all subsoiling for the records reporting this item was $1.64 per acre. A two-point subsoiler (points 3 feet apart) penetrating 16 inches deep, will cover about 1½ acres per hour.

The purpose of this tillage is to incorporate crop residue into the soil and leave the surface in a rough, broken condition, so that winter rains will be quickly absorbed. If winter rains have been insufficient to build up the moisture supply, the lands that have irrigation water available will be irrigated, which, of course, will necessitate the additional cost of throwing up borders or furrowing out and applying the water. On irrigated land it is necessary each year to give some attention to leveling. Because of wind and water erosion, cultural practices, and the decomposition of peat soils in certain areas, the surface becomes uneven. For such lands the cost would average about $1.00 per acre.

In the early spring, after the winter rains or preirrigation, many diversified operations are performed to complete the seedbed preparation.

The Swede harrow is used a great deal to pulverize the clods and smooth the surface. Sometimes weights of about 1,000 pounds are placed on the Swede harrow, which makes a combination drag and harrow. With two 10-foot sections loaded with 1,000 pounds of weight, approximately 3½ acres per hour will be covered at a cost of $1.30 per acre.

The spring-tooth harrow is also used extensively. Where two 10-foot sections are used, approximately 4½ acres per hour will be covered at a cost of about $0.70 per acre.

If weeds appear before planting time, they are destroyed with a cyclone weeder. Three 10-foot sections with a light tractor will cover about 8 acres per hour at a cost of about $0.40 per acre.

Drags, rollers, and levelers are used in special cases.

In order to hasten the aeration and warming up of the seedbed, a chisel is drawn through the soil with teeth set to penetrate to a depth of from 8 to 10 inches. Usually a spike-tooth harrow is attached behind to pulverize clods. The average cost of chiseling for the records reporting was $1.51 per acre.

All other tillage costs for all records averaged $3.44 per acre (table 4).

Planting.—Planting is usually done between May 1 and May 15 with either a four- or an eight-row planter drawn by a rubber-tired tractor. The seed is drilled to a depth sufficient to be covered with about an inch

of moist soil. Three men are usually required in operating an eight-row planter, two on the planter and one on the tractor. With this setup, from 2 to 3 acres can be planted per hour. Sometimes replanting is necessary. In this study the cost of planting ranged from $0.60 to $0.86 per acre, with an average of $0.68 for all records (table 4).

Cultivation.—From 2 to 3 cultivations are normally required for the season. Four-row tractor-drawn cultivators and sometimes eight-row cultivators are used. Cultivator attachments for rubber-tired-wheel tractors have come into wide use. The average annual cost of row cultivation as shown by the records has varied from $0.78 to $1.97, with an average for all records of $1.26 per acre.

Hoeing.—The cost of hoeing varies widely, according to the amount of weed growth in the fields. Fields are usually gone over once, and sometimes two or three times. Man labor required will vary from 1 to 3 hours per acre. Hoeing costs varied, in the study, from $0.53 to $1.95, with an average of $1.04 per acre.

Irrigation.—One and sometimes two crop irrigations are practiced on irrigated land. Occasionally winter rains may be sufficient so that no irrigation will be required. Furrowing-out for irrigation is done simultaneously with cultivation by placing shovels behind the cultivating attachments. The amount of man labor required per acre will vary considerably according to the head of water and the levelness of the land. The cost for the records reporting irrigation (table 4) varied from $1.01 to $3.12, with an average of $1.71 per acre.

Harvesting.—Harvesting operations include cutting, windrowing and piling, threshing, and hauling the beans to the warehouse. Labor and field-power costs varied from $5.21 to $9.29 per acre, with an average of $7.38 for all records. This is 12.3 per cent of all costs. Harvesting costs per acre vary almost directly with the yield.

Cutting begins about the middle of August. A general-purpose tractor mounted with blades is ordinarily used, which will cover approximately 30 acres per day. Cutting costs varied in the study from $0.60 to $0.72, with an average of $0.65 per acre (table 4).

Shortly after cutting, the beans will either be piled or windrowed, the method depending on whether or not the threshing is to be done with a stationary or pickup type of harvester. For stationary threshing, the beans are piled by hand. In an average field, from 3 to 4 acres can be piled per man in a day. If a pickup type of harvester is to do the threshing, a side-delivery rake is used for windrowing. It may be drawn behind the cutter so that cutting and windrowing are performed in one operation. Some growers prefer to windrow as a separate operation. In case of rain or damp weather, the piles or windrows may have to be turned over

onto dry ground to prevent mold or other damage to the beans. With an average crop, one man will turn from ¾ to 1½ acres per hour. The cost of man labor and field power for piling and windrowing varied from $0.85 to $2.02, with an average for all records of $1.23 per acre.

Two types of threshers are used, either a stationary or a pickup. Where a stationary thresher is used, the beans are pitched onto wagons with rack beds and hauled to the thresher. The wagons are drawn either by teams or by tractors. Where tractors are used, 3 wagons are drawn in tandem. Nine wagons are the usual complement for a stationary thresher, distributed somewhat as follows: 3 being loaded in the field, 3 en route to the thresher, and 3 being unloaded at the thresher. Of all beans, the large lima appears to be the most difficult to thresh without injury to the seed. Therefore, a great deal of skill and judgment has to be exercised in the timing and management of the threshing operations. The usual output of a stationary thresher will range from 1,500 to 2,000 bags of beans per day.

The pickup type of thresher is coming into more general use because of certain advantages: (1) smaller initial investment (therefore growers with larger acreages can afford to own their own thresher and be less dependent on commercial threshers), (2) requires a smaller crew to operate, (3) eliminates the necessity of hand-piling, and (4) provides for spreading of straw onto the land without additional handling costs. The main disadvantages are: (1) smaller capacity, (2) difficulty in maintaining uniform feeding under certain conditions, (3) possibility of unsatisfactory cleaning owing to more clods that may be raked up with the vines, and (4) possibly greater spread of noxious-weed seed.

The usual output of the pickup type of harvester ranges from 500 to 800 sacks per day.

Because of the large capital investment, threshing is usually done by commercial threshers. The charge for this ranges from 25 to 35 cents per hundredweight. The cost of labor and field power varied from $3.44 to $7.42 per acre, with an average for all records of $4.60 (table 4).

The bags of beans are loaded on trucks at the harvester and hauled to warehouses for cleaning and storage. The usual charge for commercial hauling is 2 or 3 cents a sack, according to the distance hauled. The cost of man labor and field power varied from $0.30 to $0.61, with an average for all records of $0.46 per acre.

MATERIAL COSTS

The principal materials used in producing large lima beans are seed, irrigation water, and sacks and twine (table 5). Virtually none of the growers in the study reported using manures or commercial fertilizers. A

considerable number reported spreading the straw from the bean crop back on the land. The quantity applied depended on the yield of straw, which varied from 0.5 to 1.2 tons per acre. The cost to the grower was what he could have gotten for it if sold in the field loose, plus the cost of spreading it.

The amount of seed used per acre varied from 40 to 140 pounds. This great variation was due to the kind of soil and the necessity for replanting. On hillside dry-land soils, 40 to 60 pounds of seed was required, and on irrigated soil, from 80 to 140 pounds. In case of poor stands, additional amounts of seed were required for replanting. The average cost of seed for all records in the study was $4.43 per acre (table 5).

TABLE 5

AVERAGE COSTS PER ACRE* OF MATERIALS AND SUPPLIES, 1932–1939

Item	1932	1933	1934	1935	1936	1937	1938	1939	8-year average
	dollars	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*
Seed	3.55	3.73	3.35	3.93	5.61	6.25	4.37	4.51	4.43
Irrigation water	0.51	3.94	3.02	1.44	7.33	2.74	1.97	2.75	3.07
Fertilizer	—†	0.62	0.88	4.03	1.77	3.05	1.36	3.94	1.79
Sacks and twine	1.88	1.04	1.24	1.03	1.16	1.36	1.41	1.42	1.28
Miscellaneous	—	0.24	0.05	0.02	0.17	0.51	0.74	0.10	0.26
Average total all materials*	5.94	8.21	6.84	5.75	12.98	11.27	8.73	8.89	8.63

* The cost per acre for each operation shown is the average cost for the acres on which the operation was performed; hence, the average total cost per acre, which is the average for all acres reporting, is not necessarily the sum of the individual items.

† Dashes indicate data not available.

The cost of irrigation water varied greatly. Some had no water costs because the beans were planted on land on which no irrigation facilities were available. On irrigated land some years the rainfall was adequate to produce a satisfactory crop. In other years irrigation was necessary to supplement rainfall to get maximum yields. One or two applications were usually sufficient using a total of about 10 acre-inches per acre. For all records reporting cost of water the average was $3.07 per acre.

The cost of sacks and twine varied directly with the yield. The average for all records was $1.28 per acre. Other miscellaneous items averaged $0.26 per acre.

Total material costs for all records in the study averaged $8.63 per acre.

CASH-OVERHEAD COSTS

Cash-overhead costs include general expense, taxes, insurance, and miscellaneous items (table 6). General expense, arbitrarily set at 5 per cent of the total cost of labor, field power, and materials, is charged to

cover interest on operating capital and other minor overhead costs. The average for all records reporting this item was $1.38 per acre. The item of taxes averaged $3.85 per acre. This average includes renters as

TABLE 6

Average Cash-Overhead Cost per Acre,* 1932–1939

Item	1932	1933	1934	1935	1936	1937	1938	1939	8-year average
	dollars	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*
General expense	1.68	1.40	1.23	1.09	1.57	1.66	1.41	1.42	1.38
Taxes	12.07	6.60	3.99	0.76	1.74	5.04	5.24	3.29	3.85
Insurance	0.84	0.38	0.42	0.23	0.22	0.37	0.31	0.18	0.29
Machinery repairs	—†	1.31	2.68	0.63	0.89	1.25	1.11	0.76	1.53
Miscellaneous	—	—	—	0.86	1.00	—	2.38	5.00	1.61
Average total*	14.48	9.26	6.61	2.39	3.59	7.17	7.48	5.53	6.06

* The cost per acre for each operation shown is the average cost for the acres on which the operation was performed; hence, the average total cost per acre, which is the average for all acres reporting, is not necessarily the sum of the individual items.

† Dashes indicate data not available.

well as owners, which accounts for the wide variation from year to year and the low average cost per acre. Other items are compensation insurance, blacksmith, and minor repair bills. For all records reporting cash-overhead costs the average total was $6.06 per acre.

CAPITAL-INVESTMENT COSTS

Sixty-one records in the enterprise-efficiency study reported capital-investment costs. Table 7 shows the average investment in land, irriga-

TABLE 7

Capital Investment, Interest, and Depreciation Charges per Acre, Average of 61 Records, 1932–1939

Item*	Average capital investment	Interest charge at 5 per cent	Depreciation charge	Total interest and depreciation charge
	dollars	*dollars*	*dollars*	*dollars*
Land	567.57	28.38	0.00	28.38
Irrigation system	27.21	1.36	1.92	3.28
Tillage equipment	11.23	0.56	1.42	1.98
Total	606.01	30.30	3.34	33.64

* Does not include field power or threshers or combine. Field power is included in labor cost, and threshing is usually done on custom basis.

tion facilities, and tillage and harvesting equipment for the coöperators in the study who owned the land on which they grew the beans, and the interest and depreciation charges per acre. Table 7 does not include

field power, tractors, trucks and horses, or threshing machinery; the cost of these items is included in labor and field-power costs. The average value of land as reported was $567.57 per acre, of irrigation facilities $27.21, and of tillage and harvesting equipment $11.23, or a total of $606.01 per acre. Interest on investment was calculated at 5 per cent. The average total charge for interest on investment was $30.30 per acre, depreciation averaged $3.34, or a total of $33.64 for capital overhead costs.

TABLE 8

RENTAL COSTS PER ACRE, 1932–1939

Rental basis	Dry land		Irrigated land	
	Records reported	Average cost	Records reported	Average cost
	number	*dollars*	*number*	*dollars*
Cash rent per acre	1	10.83	3	34.16
1/5 share beans and all straw	0	0.00	2	17.36
1/4 share beans and straw	4	10.80	0	0.00
1/4 share beans and all straw	8	11.90	3	16.98
30 per cent share beans and straw	2	12.85	0	0.00
1/3 share beans only	0	0.00	4	25.77
1/3 share beans and straw	3	13.58	21	22.46
1/3 share beans and all straw	5	12.82	20	25.13
2/5 share beans and straw	0	0.00	10	50.76
Total records reported	23	.....	63	.....

RENTAL COSTS

Of the 161 records in the enterprise-efficiency study, 86 were reported as renters; 4 of these paid cash rent and 82 paid a share of the crop (table 8); and 23 rented dry land and 63 irrigated land. One cash renter paid $10.83 per acre for dry land; 3 cash renters paid an average of $34.16 per acre for irrigated land. The share renters on dry land paid a share varying from 1/5 of the beans and all the straw to 1/3 of beans and all straw. The value of the share paid to the landowner varied from $10.80 to $13.58 per acre on dry land. The share renters on irrigated land paid a share varying from 1/5 of beans and all straw to 2/5 of beans and straw. The value of the share paid as rent varied from $16.98 to $50.76 per acre. The largest number of renters (8) on dry land paid 1/4 share of beans and all the straw, whereas on the irrigated land the largest number (21) paid 1/3 share of beans and straw and 20 paid 1/3 share of beans and all the straw. In comparing tables 7 and 8, one finds that land costs (charged at 5 per cent of the capital investment) and cash rent or share rent average about the same.

STANDARD COSTS

Since past costs require some adjustment to make them applicable to any particular set of conditions with reference to time and place, table 9 is presented as a standard of inputs of labor, materials, and costs under specified conditions on a typical owner-operated, 100-acre irrigated farm having better-than-average management. Its greatest value will be to serve as a guide in setting up more apropriate standards for local or changed conditions.

The inputs of hours of man labor and field power with the rates charged per hour, quantities of materials used, prices paid, value of capital inputs with interest and depreciation charges are shown so that any grower can adapt this standard to his own setup. Since the costs in this standard, with adjustments for a higher yield, are about the same as the average for the records in the study, this may, therefore, be considered a goal attainable on a well-managed place. Many adjustments will need to be made for individual farms. Changes in yield per acre will require an adjustment in costs of harvesting per acre. Wages, prices of materials, taxes, and water rates, are continually changing. The amounts of fertilizer, seed, and water required are different for different soils and different seasons or climatic conditions. All these factors must be considered in adapting this standard to a particular place at a given time.

This standard indicates the cash costs would be $50.92 per acre. Adding to this, depreciation charges and 5 per cent interest on investment, the total costs would be $81.01 per acre. With an 1,800-pound yield, the cash costs would be $2.83 and all costs $4.50 per hundredweight.

MARKETING LARGE LIMA BEANS

Preparation for Market.—Large lima beans come from the thresher in sacks weighing 103 to 108 pounds. In this form they are called "field-run" beans. They are hauled to the local warehouse where they are cleaned in order to insure ready acceptance on the market. The cleaning process consists in running them through a series of machines. The first is a screen separator and aspirator which removes clods, stones, broken beans, bits of stems and pods, dust, and other foreign material. The second machine consists of adobe rolls which remove clods and foreign materials by a rolling process. Discolored and damaged beans and foreign material that remain in the beans are picked out by hand. Broken and split beans are permissible, not to exceed 2 per cent. The usual charges are $2.00 per ton for the machine work. A charge of $1.40 per ton is made for hand-picking beans in which not to exceed 1 per cent is picked out, and $1.00 per ton is added for each additional per cent.

Dockage.—The material thus removed from field-run beans is called "dockage." The average dockage for the records in the study was 6.1 per cent. The cull beans, which consist of broken, split, damaged, or imma-

TABLE 9

STANDARD OF INPUTS AND COSTS FOR PRODUCTION OF LARGE LIMA BEANS ON IRRIGATED LAND IN SOUTHERN CALIFORNIA*

Item	Man labor per acre	14 h.p. tractor work per acre	28 h.p. tractor work per acre	1½-ton truck work per acre	Costs per acre	Costs per hundredweight
Labor costs†						
	hours	*hours*	*hours*	*hours*	*dollars*	*dollars*
Plowing	1.2	...	1.2	...	2.16	....
Other preparatory tillage	3.0	0.5	2.5	...	5.05	....
Total land preparation	4.2	0.5	3.7	...	7.21	....
Planting	1.2	0.5	...	0.1	0.92	....
Cultivating	1.5	1.5	...	...	1.65	....
Hoeing	3.0	...	...	...	0.90	....
Irrigating	6.0	...	...	...	1.80	....
Miscellaneous	4.0	1.0	...	1.0	3.60	....
Total cultural labor	19.9	3.5	3.7	1.1	16.08	0.89
Cutting, windrowing, etc.	3.0	1.0	...	...	1.80	0.10
Combining with pickup, 0.8 hr. per acre.	4.0	...	0.8	...	3.92	0.22
Hauling	0.6	...	...	0.4	0.82	0.05
Total labor costs	27.5	4.5	4.5	1.5	22.62	1.26
Material costs						
					dollars	*dollars*
Irrigation water or power, 10 acre-inches at $0.60					6.00	....
Fertilizer (allowance for occasional use)					4.00	....
Seed, 100 pounds at $5.00 per hundredweight					5.00	....
Sacks and twine, 18 at $0.10					1.80	....
Miscellaneous					0.50	....
Total material costs					17.30	0.96
Cash-overhead costs						
					dollars	*dollars*
General expense, estimated at 5 per cent of above					2.00	....
County taxes, $250.00 valuation at 3 per cent rate					7.50	....
Machinery repairs					1.00	....
Compensation insurance					0.50	....
Total cash overhead					11.00	0.61
Total cash costs (labor, material, and cash overhead)					*50.92*	*2.83*

TABLE 9 (*Concluded*)

Standards of Inputs and Costs for Production of Large Lima Beans on Irrigated Land in Southern California*

	Costs per acre	Costs per hundred-weight
Depreciation costs‡		
	dollars	*dollars*
Depreciation on irrigation system	1.50	....
Depreciation on tillage equipment	1.20	....
Depreciation on planting equipment	0.06	....
Depreciation on harvesting equipment	0.75	....
Depreciation on miscellaneous equipment	0.10	....
Total depreciation costs	3.61	0.20
Total cash and depreciation costs	*54.53*	*3.03*
Interest costs, computed at 5 per cent of average value‡		
	dollars	*dollars*
Interest on value of irrigation system, $15.00	0.75	....
Interest on value of tillage equipment, $6.00	0.30	....
Interest on value of planting equipment, $0.50	0.03	....
Interest on value of harvesting equipment, $7.50	0.37	....
Interest on value of miscellaneous equipment, $0.50	0.03	....
Interest on value of land, $500.00	25.00	....
Interest on total investment $529.50	26.48	1.47
Total all costs	*81.01*	*4.50*

* This table is a computed standard of costs for a well-managed, 100-acre, owner-operated farm typical of the better-irrigated land on the southern California coastal plain, and assumes a yield of 1,800 pounds of beans per acre.

† Labor and field-power costs are computed at the following rates per hour: common man labor, $0.30; tractor and truck drivers, $0.40; harvesting crew, $0.50; 14-drawbar-horsepower tractor, $0.70; 28-drawbar-horsepower tractor, $1.40; 1½-ton truck, $1.50.

‡ Equipment and facilities are assumed to serve 100 acres with the exception of planting and harvesting equipment, which is assumed to serve 200 acres. Average values are estimated at one half of the original cost.

ture beans, have some value as a stock feed and are usually sacked and sold for about $8.00 per ton.

Even Weighting.—In the early days of the bean industry, beans were shipped in 80-pound bags, but now the crop is shipped in bags of an even 100 pounds. A charge of 10 cents per ton is made for even weighting.

Commercial Grading.—Arbitrary grades are established each year by the Grain Inspection Department of the Grain Trade Association. These are based on samples and are representative of the crop for the season. The designations, such as "F. A. Q. No. 1," used in this connection refer to the "fair average quality" as determined by the Association. Small representative samples of the different F. A. Q. grades are

sent to various dealers who use them to determine the grade of any particular lot.

Warehousing.—The recleaned beans are stored in warehouses until finally moved to the market. The usual storage period averages five or six months. The usual charges made for storage are $0.75 to $1.00 per ton for the first month and $0.25 for each succeeding month. A handling charge of $0.25 per ton is made on all stored beans.

Estimated costs of warehousing and preparing large lima beans for market on a hundredweight basis are as follows:

Item	Cost per hundredweight in dollars
Cleaning	0.120
Hand-picking	0.100
Even weighting	0.005
Handling	0.012
Storage	0.085
Insurance	0.030
Total	0.352

Market Channels.—The crop of large lima beans is marketed through the California Lima Bean Growers' Association and local buyers and dealers.

The present association with headquarters at Oxnard was organized in 1916 and is the outgrowth of previous attempts in coöperative marketing. The organization is made up of some 20 local units organized in as many communities. The bean grower takes out a membership in the local unit. Each local unit elects a director to the central organization. This central board directs the activities of the central association.

The function of the local unit is to receive the beans from the individual member, to warehouse, process, and package them ready for market. The central association is charged with the responsibility of selling the crop and returning the net proceeds to the locals, which in turn, after deducting the costs of the organization, distribute the net proceeds to the individual members.

The central organization, in addition to selling, has done considerable promotion of market demand by means of advertising and developing new methods of utilization. The central organization has made representation of growers' interest in relation to the tariff and freight rates on beans. During the past few years the Association has handled approximately 55 to 75 per cent of the crop.

Local buyers and dealers, through whom the growers may readily dispose of their crop, are well distributed throughout the producing areas.

Cull beans are sacked and are taken back by the grower and utilized

as a feed for hogs, or they may be sold to feeders or feed dealers. All cull beans must be inspected by representatives of the county agricultural commissioner's office for noxious-weed seed. Permits are issued for cull beans containing noxious-weed seed to insure that they will be ground or handled in such a way that the noxious-weed seed will be destroyed. Bean straw is disposed of usually by each individual grower at his ranch. It is recognized as a good feed for cattle and sheep, especially when mixed with silage and alfalfa and fed with concentrates. Bean straw is also recognized as an excellent organic fertilizer, and a large part of the crop is sold annually to citrus growers. Many growers, however, spread the straw back on the land on which the crop was grown and thus maintain soil fertility.

Market Prices.—The price of beans, like that of any other commodity, is determined principally by the supply of and the demand for beans. Beans have the essential characteristics necessary for wide distribution. They are nonperishable, easily transported, and in general demand; hence, they are a staple commodity in all markets.

All varieties of beans do not compete directly with every other variety in the consuming market. Most varieties differ in appearance and flavor and have therefore their own particular markets. The extent of the competition between the different varieties of beans in the consuming markets can be determined by a comparison of their relative price changes.

Table 10 presents the average annual f.o.b. market quotations as reported by the *California Fruit News* over a period of twenty years, 1920–21 to 1939–40, for California beans by varieties. The large lima has maintained during this period a higher average price than any other variety with an average of $7.42 per hundredweight. Red Kidney beans ranked second with an average of $7.12, Bayo third, and baby lima fourth.

The average for the ten-year period 1930–31 to 1939–40 shows the Red Kidney bean taking first place with an average price of $5.62 per hundredweight and the large lima, second place with an average price of $5.51. The baby lima, which is considered a close competitor of the large lima, for the twenty-year period averaged $0.95 less than the large lima. For the ten-year period 1920–21 to 1929–30, it ranked second to large lima in price and averaged $0.36 less; in the ten-year period 1930–31 to 1939–40 it ranked fifth in price and averaged $1.55 per hundredweight less than large limas.

Table 11 shows the average monthly prices of large lima beans from 1920–21 to 1939–40, as well as the wide variations in prices, that have occurred during the past twenty years. Note that the average annual

price has varied from a low of $4.26 per hundredweight in 1931–32 to a high of $13.88 in 1924–25, with an average of $7.42. The first ten years of this period the price averaged $9.34 per hundredweight, and the last ten years it averaged $5.51.

TABLE 10

AVERAGE ANNUAL PRICES* PER 100-POUND BAG OF CALIFORNIA BEANS BY VARIETIES, 1920–21 TO 1939–40

Crop year, September–August	Large lima	Red Kidney	Bayo	Baby lima	Cranberry	Small White	Blackeye	Pink	Mexican Red (California Red)	Pinto
	dollars	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*
1920–21	6.11	9.51	9.40	5 56	6.44	4.00	6.46	5.95	7.17	—†
1921–22	7.62	7.33	5.46	7.49	7.15	5.69	4.57	5.29	4.64	—
1922–23	7.83	7.23	6.67	9.91	7.05	6.37	4.76	5.40	5.01	—
1923–24	10.50	7.44	6.24	10.52	5.67	6.19	6.76	4.86	5.68	—
1924–25	13.88	10.17	7.50	12.74	7.40	7.41	9.64	7.52	7.74	—
1925–26	9.89	9.96	11.03	9.54	7.55	6.04	5.72	5.60	5.19	—
1926–27	6.10	8.64	6.68	5.16	6.61	6.70	3.89	5.10	5.21	—
1927–28	7.48	7.67	5.08	7.64	6.78	7.59	4.93	5.56	4.92	—
1928–29	12.24	7.97	8.10	10.80	8.14	9.17	9.47	6.64	5.56	—
1929–30	11.71	10.27	9.87	10.48	7.33	7.91	8.36	5.93	5.03	—
1930–31	6.85	8.47	6.27	4.91	5.65	4.66	3.33	3.86	3.04	2.87
1931–32	4.26	3.29	3.44	2.84	3.65	2.72	2.58	2.95	2.99	2.53
1932–33	4.77	3.50	4.76	3.98	3.85	3.21	3.35	3.04	2.62	3.67
1933–34	5.52	6.06	6.19	3.73	5.09	3.45	2.93	3.19	3.49	3.82
1934–35	5.57	6.26	5.78	3.93	5.67	3.52	4.04	5.41	4.69	6.27
1935–36	6.62	5.81	3.66	5.32	3.77	3.62	4.56	3.09	3.28	3.29
1936–37	7.23	8.50	6.58	5.38	6.51	6.48	4.99	4.83	5.56	5.46
1937–38	4.87	4.80	6.76	3.19	5.11	3.05	2.91	4.43	3.75	4.64
1938–39	4.55	3.99	4.56	2.94	4.37	2.92	3.35	3.40	3.00	3.96
1939–40	4.87	5.53	6.85	3.39	3.22	3.85	4.66	4.37	3.55	3.65
Averages:										
1920–21 to 1929–30	9.34	8.62	7.60	8.98	7.01	6.71	6.46	5.79	5.61	—
1930–31 to 1939–40	5.51	5.62	5.48	3.96	4.69	3.75	3.67	3.86	3.60	4.02
1920–21 to 1939–40	7.42	7.12	6.54	6.47	5.85	5.23	5.06	4.82	4.61	—

* Choice recleaned, f.o.b. rail California, straight cars.

† Dashes indicate data not available.

Source of data:
California Fruit News. Compiled from weekly quotations.

A study of the monthly prices of large lima beans discloses that the lowest monthly price was in April and May of 1932 with an average of $3.65, and the highest price was in August, 1929, with an average of $15.02.

A study of average monthly prices indicates that for the twenty-year period, April was the high month with an average of $7.63 per hundredweight and December the low month with $7.06; the seasonal spread averaged $0.57. The September price, the first month of the crop year,

TABLE 11

MONTHLY PRICES* PER 100-POUND BAG OF LARGE LIMAS, F.O.B. CALIFORNIA, 1920–21 TO 1939–40

Crop year, September–August	Sept.	Oct	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Average
	dollars	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*
1920–21	9.11	6.78	6.75	5.88	5.85	5.92	5.81	5.53	5.52	5.49	5.28	5.41	6.11
1921–22	5.84	5.72	6.00	6.42	6.53	7.90	8.92	9.06	9.05	9.20	9.00	7.88	7.62
1922–23	5.58	7.03	7.73	8.43	8.72	8.83	8.81	8.79	7.54	7.43	7.33	7.51	7.83
1923–24	8.34	8.33	9.36	9.33	9.89	10.66	11.46	11.81	11.54	11.59	11.72	11.97	10.50
1924–25	12.45	13.54	12.98	12.90	13.35	13.96	14.23	14.37	14.42	14.70	14.92	14.81	13.88
1925–26	14.63	12.39	10.82	10.18	10.62	10.41	10.06	8.98	7.56	7.79	7.80	7.44	9.89
1926–27	7.00	6.87	6.42	5.93	6.06	5.99	5.95	5.95	5.86	5.70	5.72	5.73	6.10
1927–28	5.90	6.07	5.97	5.91	6.16	7.20	7.55	8.53	9.14	9.13	9.13	9.05	7.48
1928–29	8.60	8.89	9.52	11.32	12.33	12.84	12.83	12.94	13.40	14.41	14.78	15.02	12.24
1929–30	12.13	11.81	12 53	12.28	11.32	11.30	12.11	11.89	11.63	11.17	11.49	10.88	11.71
1930–31	9.33	8 49	7.47	6.23	6.65	7.19	6.95	6.86	6.67	5.68	5.12	5.60	6.85
1931–32	5.37	4.65	5.14	4.76	4.37	3.71	3.75	3.65	3.65	3.77	3.87	4.41	4.26
1932–33	4.89	4.79	3.93	3.85	3.84	3.67	3.73	4.36	5.70	6.10	6.03	6.31	4.77
1933–34	5.95	5.19	5.23	5.03	5.18	5.50	5.92	5.83	5.65	5.61	5.55	5.55	5.52
1934–35	6.16	6.10	5.80	5.62	5.72	5.71	5.59	5.36	5.33	5.24	5.15	5.02	5.57
1935–36	5.36	5.79	5.84	5.91	6.19	6.74	7.22	7.18	7.08	6.92	7.48	7.70	6.62
1936–37	7.16	7.07	7.28	7.22	7.35	7.61	7.63	7.59	7.32	7.17	6.98	6.41	7.23
1937–38	5.81	5.29	4.86	4.60	4.65	4.65	4.70	4.71	4.68	4.68	4.89	4.92	4.87
1938–39	4.76	4.53	4.45	4.46	4.47	4.42	4.41	4.48	4.59	4.66	4.65	4.67	4.55
1939–40	5.25	5.55	5.19	4.86	4.87	4.77	4.71	4.66	4.72	4.72	4.66	4.50	4.87
Averages:													
1920–21 to 1929–30	8.96	8.74	8.81	8.86	9.08	9.50	9.77	9.79	9.57	9.66	9.72	9.57	9.34
1930–31 to 1939–40	6.00	5.75	5.52	5.25	5.33	5.40	5.46	5.47	5.54	5.46	5.44	5.51	5.51
1920–21 to 1939–40	7.48	7.24	7.16	7.06	7.21	7.45	7.62	7.63	7.55	7.56	7.58	7.54	7.42

* Choice recleaned, f.o.b. rail California, straight cars.

Source of data:
California Fruit News. Compiled from weekly quotations.

TABLE 12

MONTHLY PRICES* PER 100-POUND BAG OF BABY LIMAS, F.O.B. CALIFORNIA, 1920–21 TO 1939–40

Crop year, September–August	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Average
	dollars	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*	*dollars*
1920–21	8.87	6.52	6.36	5.45	5.50	5.56	5.39	5.05	4.80	4.61	4.27	4.37	5.56
1921–22	4.99	5.14	5.68	6.45	6.50	7.57	8.92	9.06	9.11	9.23	9.11	8.08	7.49
1922–23	6.03	7.84	9.15	10.73	10.88	10.96	10.82	10.83	10.45	10.50	10.50	10.22	9.91
1923–24	9.37	8.73	10.53	10.07	10.29	10.82	11.50	11.62	11.17	10.68	10.65	10.79	10.52
1924–25	11.22	12.54	12.25	12.04	12.47	13.07	13.05	13.07	13.17	13.28	13.38	13.38	12.74
1925–26	13.38	10.95	10.41	10.07	10.54	10.32	9.66	8.78	7.56	7.86	7.70	7.28	9.54
1926–27	6.72	6.24	5.33	4.94	4.92	4.37	4.31	4.38	4.87	5.08	5.37	5.36	5.16
1927–28	5.90	6.08	6.01	6.07	6.96	8.17	8.32	9.08	9.26	9.08	8.67	8.07	7.64
1928–29	7.92	8.88	9.35	10.11	10.77	11.44	11.41	11.20	11.60	12.42	12.22	12.29	10.80
1929–30	10.63	10.71	10.59	10.25	9.67	10.13	11.15	10.96	10.60	10.32	10.54	10.17	10.48
1930–31	8.48	6.25	4.97	4.60	4.74	4.84	4.35	4.43	4.43	3.98	3.72	4.11	4.91
1931–32	3.61	3.15	3.43	3.12	2.87	2.40	2.33	2.31	2.43	2.51	2.55	3.39	2.84
1932–33	3.83	4.09	3.48	3.25	3.13	3.06	3.11	3.82	4.91	4.95	5.00	5.17	3.98
1933–34	4.80	3.97	3.98	3.58	3.54	3.81	3.80	3.50	3.36	3.38	3.36	3.73	3.73
1934–35	4.41	4.04	3.76	3.75	3.83	3.80	3.75	3.87	4.09	4.04	3.95	3.89	3.93
1935–36	4.09	4.28	4.43	4.41	4.95	5.76	6.13	6.09	5.82	5.63	6.11	6.17	5.32
1936–37	5.36	5.68	5.89	5.78	5.90	6.13	5.96	5.74	5.22	4.65	4.33	3.91	5.38
1937–38	3.69	3.36	2.96	2.90	3.10	3.02	2.96	2.92	2.93	3.15	3.68	3.57	3.19
1938–39	3.38	3.17	2.89	2.83	2.85	2.80	2.74	2.76	2.99	3.00	2.95	2.91	2.94
1939–40	3.71	3.53	3.29	3.25	3.31	3.28	3.28	3.28	3.43	3.48	3.47	3.37	3.39
Average:													
1920–21 to 1929–30	8.50	8.36	8.57	8.62	8.85	9.24	9.45	9.40	9.26	9.31	9.24	9.00	8.98
1930–31 to 1939–40	4.54	4.15	3.91	3.75	3.82	3.89	3.84	3.87	3.96	3.88	3.91	4.02	3.96
1920–21 to 1939–40	6.52	6.26	6.24	6.18	6.34	6.57	6.65	6.64	6.61	6.59	6.58	6.51	6.47

* Choice recleaned, f.o.b. rail California, straight cars.

Source of data:
California Fruit News. Compiled from weekly quotations.

averaged $7.48; a steady decline then occurred through December, which was followed by an increase until May, with a slight decline until August.

A similar study of price changes of baby limas, a close competitor of large limas, is shown in table 12.

The large lima bean for many years has commanded the highest price of all varieties of beans with the exception of the past few years when the Red Kidney has averaged slightly higher. Since the Red Kidney, however, is not a direct market competitor of the large lima and is grown in California for seed purposes, this does not offer, at the present time, any serious threat to the price leadership of the large lima.

It appears from a study of tables 10, 11, and 12, that in the past ten years the price differential between large limas and baby limas has been increasing. This is probably due to the fact that the production of the large lima is very definitely limited to a narrow area along the coast of southern California, and thus the total supply has been fairly constant. The area adapted to baby limas is not so limited as it was formerly believed. A few years ago, the main center of baby lima production was in the San Fernando Valley. Since then production has been extended to many of the important bean-producing districts of the state. This increased acreage has resulted in the coming of larger supplies onto the market each year, so that price declines of baby limas have been more rapid than large limas.

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